Section 5

5.0 ANALYSIS OF ENVIRONMENTAL AND HEALTH CONSEQUENCES OF CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM ACTIVITIES AND MITIGATION MEASURES

5.1 Analysis Methodology

For each environmental attribute discussed in Sections 5.2 through 5.12, the potential impacts of Chemical and Biological Defense Program (CBDP) activities are identified. The potential impacts at the example sites are then evaluated qualitatively, based on site-specific information on the existing environment presented in Sections 4.2 through 4.7 and the applicable regulatory and guidance benchmarks and mitigation measures for existing CBDP activities presented in Sections 2.4.1 through 2.4.7.

The potential for significant adverse impacts is related primarily to safety, health, security, and waste management considerations, as discussed in Section 3.3. Safety, health, and security impacts apply to workplace activities at CBDP sites, which may affect the workforce through possible exposures to hazardous and/or toxic chemicals; high-hazard biological materials (for the purposes of this document, those material requiring biosafety level-3 and -4 containment facilities and procedures); lasers; and radiation. Waste management impacts result from the accumulation, storage, treatment, and disposal of sanitary and/or industrial wastewater, solid and hazardous waste, and air emissions at and from sites of CBDP activity, which may also affect the workforce and the local population. In addition, potential environmental degradation from the waste management impacts can lead to secondary impacts on various environmental attributes, as discussed in Section 1.3.3.2. Impacts on the environment associated with construction actions are not addressed.

The benchmark regulations and guidance, including regulations of the Department of Defense (DoD) components presented in Section 2.3, provide engineering controls, protective equipment, and procedures, as applicable, for security and to protect worker health and safety and the environment. Additional safeguards are available through state and local regulations and site-specific regulations and standard operating procedures for CBDP activities, as illustrated for the selected example sites in Section 2.4. If these provisions are effective, significant adverse consequences would be expected to occur only as a result of either procedural noncompliance—negligent or intentional—or as a result of failure of the engineering controls or protective equipment. The effectiveness of benchmark guidance and regulations on protective measures for occupational safety and health and public health is demonstrated in Section 5.12, using programmatic evaluation reports and documented information on the occurrence of accidents, injuries, or laboratory-acquired illnesses (LAIs).

Each of the analyses presented in Sections 5.2 through 5.12 ends with a summary and qualitative conclusions concerning existing and cumulative impacts of CBDP activities on each environmental attribute. This provides the basis for projection from the example sites to the programmatic level, discussed in Section 5.13. Analyses for cumulative impacts appear in

Section 5.14, comprised of cumulative impacts with time, cumulative impacts with other programs, and regionally cumulative impacts.

Comparison of the alternatives and selection of the Preferred Alternative appear in Section 5.15. The conclusions were applied to qualitative evaluation of potential future environmental impacts for both the proposed action and the No Action Alternative. This information provided the basis for selection of the proposed action as the Preferred Alternative.

5.2 Analysis of Air Quality Impacts of CBDP Activities at the Example Sites

CBDP activities have the potential to impact air quality through air pollutant emissions directly generated by CBDP activities. Combustion of fossil-fuel energy resources for backup power systems at CBDP facilities and emissions generated by CBDP personnel vehicles and from shipments related to CBDP activities provide additional potential sources for air quality impacts. Incinerator emissions from on-site disposal of medical waste and other nonhazardous solid waste generated by CBDP activities also have the potential to impact air quality.

5.2.1 Air Quality Impacts at the Edgewood Chemical Biological Center and the U.S. Army Medical Research Institute of Chemical Defense (Aberdeen Proving Ground)

CBDP activities at the Edgewood Chemical Biological Center (ECBC) and the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD) have minor negative impacts on local air quality in the Edgewood Area. A release of biological toxin, chemical agent, or hazardous air pollutant (HAP) during CBDP testing activities at ECBC would be highly improbable because of the engineering controls and SOPs described in Sections 2.4.1.3.a. and 2.4.2.3.a. Air emissions from ECBC emergency generators are mitigated by permit restrictions, as noted in Section 2.4.1.2.c. Solid waste generated at ECBC and USAMRICD is incinerated at the Harford County Waste-to-Energy Plant (WEP), which adjoins the installation; adherence to air emission permit restrictions for the WEP mitigates potential impacts on local air quality (see Section 2.4.1.2.c). The secondary impact of vehicular emissions attributable to CBDP activities at ECBC and USAMRICD constitutes an insignificant fraction of the regional total, since CBDP personnel and economic activity have a minor local transportation impact (see Section 5.9.1). Similarly, emissions of ozone (O_3) precursors due to CBDP activities at ECBC and USAMRICD have an insignificant impact on the current severe nonattainment status of O_3 in Harford County and the Baltimore-Washington Air Quality Control Region (AQCR) (see Section 4.2.1).

5.2.2 Air Quality Impacts at the Naval Surface Warfare Center Dahlgren Laboratory

CBDP activities at the Naval Surface Warfare Center Dahlgren Laboratory (NSWCDL) have minor negative impacts on local air quality in the Dahlgren area. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.3.3.a. Solid waste and disinfected medical waste generated at NSWCDL are incinerated off site; adherence to air emission permit restrictions for this facility mitigates impacts on local air quality. The secondary impact of vehicular emissions attributable to CBDP activities at NSWCDL constitutes an insignificant fraction of the regional total, since CBDP personnel and economic activity have a negligible local transportation impact (see Section 5.9.2).

5.2.3 Air Quality Impacts at the U.S. Army Medical Research Institute of Infectious Diseases

CBDP activities at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) have minor negative impacts on local air quality in the area of Fort Detrick. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.4.3.a. HAP emissions of formaldehyde from equipment decontamination using paraformaldehyde are mitigated by following SOPs (see Section 2.4.4.3.a). Solid waste and disinfected medical waste generated at USAMRIID are incinerated on site at the Incinerator Complex; adherence to air emission permit restrictions for the two municipal solid waste incinerators and the two medical waste incinerators at the Incinerator Complex mitigates impacts on local air quality (see Section 2.4.4.2.c). The secondary impact of vehicular emissions attributable to CBDP activities at USAMRIID constitutes an insignificant fraction of the regional total, since CBDP personnel and economic activity have a minor local transportation impact (see Section 5.9.3). Similarly, emissions of O_3 precursors due to CBDP activities have an insignificant impact on the current serious nonattainment status of O_3 in Frederick County and the Washington-Baltimore AQCR (see Section 4.4.1).

5.2.4 Air Quality Impacts at Dugway Proving Ground

CBDP activities at Dugway Proving Ground (DPG) have minor negative impacts on local air quality in the Tooele area. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.5.3.a. Emissions from outdoor CBDP testing are mitigated by use of biological or chemical simulants, in accordance with benchmark legal requirements. The secondary impact of vehicular emissions attributable to CBDP activities at DPG constitutes an insignificant fraction of the regional total, since CBDP personnel and economic activity have a minor local transportation impact (see Section 5.9.4).

5.2.5 Air Quality Impacts at the University of Texas Medical Branch

CBDP activities at the University of Texas Medical Branch (UTMB) have negligible negative impacts on local air quality in the Galveston area. Solid waste and disinfected medical waste generated at UTMB are incinerated off site; adherence to air emission permit restrictions for the incineration facilities mitigates impacts on local air quality (see Section 2.4.6.2.c). The secondary impact of vehicular emissions attributable to CBDP activities at UTMB constitutes an insignificant fraction of the regional total, since CBDP personnel and economic activity have a negligible local transportation impact (see Section 5.9.5). Similarly, emissions of O_3 precursors due to CBDP activities have an insignificant impact on the current nonattainment status of O_3 in the Houston/Galveston AQCR (see Section 4.6.1).

5.2.6 Air Quality Impacts at the Battelle Memorial Institute, West Jefferson

CBDP activities at the Battelle Memorial Institute, West Jefferson (BMI), have minor negative impacts on local air quality in the West Jefferson area. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.7.3.a. Disinfected medical waste generated at BMI is

incinerated on site at the pathological waste incinerator; adherence to air emission permit restrictions for this facility mitigates impacts on local air quality (see Section 2.4.7.2.c). The secondary impact of vehicular emissions attributable to CBDP activities at BMI constitutes an insignificant fraction of the regional total, since CBDP personnel and economic activity have a minor local transportation impact (see Section 5.9.6).

5.2.7 Air Quality Impact Summarization

Air quality impacts of CBDP activities are negligible at UTMB and minor at the other example sites.

Potential emissions of biological toxins, chemical agents, or HAPs generated by CBDP laboratory activities are mitigated by engineering controls, in accordance with benchmark regulations and guidance discussed in Sections 2.3.4 and 2.3.5 and by site-specific SOPs. Emissions from outdoor CBDP testing, which are generated only at DPG, are mitigated by use of biological or chemical simulants, in accordance with benchmark legal requirements. Other air emissions directly generated by CBDP activities are minimal and mitigated by adherence to air emission permit requirements.

Incinerator emissions are mitigated by following SOPs that require medical waste to be rendered noninfectious and by adherence to air emission permit requirements. Vehicular emissions attributable to CBDP personnel and activities are negligible relative to their (site-specific) AQCR, based on the negligible to minor local transportation impacts (see Section 5.9). Similarly, emissions of O_3 precursors have insignificant impacts (site-specific) on the current nonattainment status of O_3 in affected AQCRs.

5.3 Analysis of Biological Resource Impacts of CBDP Activities at the Example Sites

Biological resources include the plant and animal ecology (both terrestrial and aquatic), critical habitats, and species of special concern. CBDP activities have the potential to impact biological resources through waste management impacts or safety, health, and security impacts such as a release of biological or chemical agent or escape of a laboratory animal. Impacts of construction activities are not included in the scope of the analysis (see Section 3.3).

5.3.1 Biological Resource Impacts at ECBC and USAMRICD (Aberdeen Proving Ground)

CBDP activities at ECBC and USAMRICD have negligible to minor adverse impacts on plant and animal ecology in the Edgewood Area of Aberdeen Proving Ground (APG). A release of biological toxin, chemical agent, or HAP during CBDP testing activities at ECBC would be highly improbable because of the engineering controls and SOPs described in Section 2.4.1.3.a. ECBC holds U.S. Department of Agriculture permits for plant pests that require containment of organisms.

Escape of a laboratory animal, healthy or infected, would be highly unlikely because of the design of the physical facilities in accordance with benchmark guidelines described in Section 2.3.5.1.c and use of SOPs, as described in Sections 2.4.1.3.a. and 2.4.2.3.a. The facilities where

laboratory animals are housed have barriers to reduce the likelihood of animal escape, including self-closing doors, sealed wall penetrations, and species-appropriate systems. In addition, higher-level animal containment laboratories do not have windows to the outside. The probability that an animal bred for laboratory research could escape and survive in the wild is extremely remote. No such escapes have been recorded at either ECBC or USAMRICD.

Bald eagles have been identified as a species of concern on the Edgewood Area of APG, as noted in Section 4.2.2. Potential impacts on the bald eagle population are mitigated by the Bald Eagle Management Plan, which requires review and approval of new construction or activities within a 1,000-meter (3,281-foot) radius buffer zone of a bald eagle nesting area. Existing ECBC and USAMRICD facilities lie within such a buffer zone. During the nesting season, new construction or activities must not be conducted within a 500-meter (1,640.5-foot) radius of a bald eagle nest.

5.3.2 Biological Resource Impacts at NSWCDL

CBDP activities at NSWCDL have negligible adverse impacts on plant and animal ecology in the Dahlgren area. A release of biological toxin, chemical agent, or HAP during CBDP testing activities would be highly improbable because of the engineering controls and SOPs described in Section 2.4.3.3.a. The NSWCDL Safety Office maintains a list of all etiologic agents on site. None of these etiologic agents cause plant disease. There are no potential impacts from laboratory animals at NSWCDL, since none are used.

Bald eagles are present at NSWCDL. The nearest nesting site to the CBDP facilities is over a mile away. Another species of concern, the state-listed funnel-web spider, was found in a wooded area over a mile away from the CBDP facilities (see Section 4.3.2.3).

5.3.3 Biological Resource Impacts at USAMRIID

CBDP activities at USAMRIID have negligible adverse impacts on plant and animal ecology in the Fort Detrick area. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.4.3.a. Furthermore, the etiologic agents used in CBDP research, development, test, and evaluation (RDT&E) activities at USAMRIID do not cause plant disease.

Escape of a laboratory animal, healthy or infected, would be highly unlikely because of the design of the physical facilities in accordance with benchmark guidelines described in Section 2.3.5.1.c and use of SOPs, as described in Section 2.4.4.3.a. The facilities where laboratory animals are housed have barriers to reduce the likelihood of animal escape, including self-closing doors, sealed wall penetrations, lack of windows, and species-appropriate systems. The probability that an animal bred for laboratory research could escape and survive in the wild is extremely remote. No such escapes have been recorded at USAMRIID.

5.3.4 Biological Resource Impacts at DPG

CBDP activities at DPG have negligible adverse impacts on plant and animal ecology in the Tooele area. A release of biological toxin, chemical agent, or HAP during aerosol testing would

be highly improbable because of the engineering controls and SOPs described in Section 2.4.5.3.a. Furthermore, the etiologic agents used in CBDP RDT&E activities at DPG do not cause plant disease.

Escape of a laboratory animal, healthy or infected, would be highly unlikely because of the design of the physical facilities in accordance with benchmark guidelines described in Section 2.3.5.1.c and use of SOPs, as described in Section 2.4.5.3.a. The facilities where laboratory animals are housed have multiple barriers to reduce the likelihood of animal escape. The probability that an animal bred for laboratory research could escape and survive in the wild is extremely remote. No such escapes have been recorded at DPG.

A number of federally endangered, threatened, and candidate plant and wildlife species, as well as state threatened and endangered species and sensitive species, potentially occur or have been documented at DPG. In addition, several areas at DPG are recognized as being unique biological resource areas or as important habitats (see Section 4.5.2.3). These biological resources are located far from any CBDP activities, and impacts on them are mitigated by adherence to procedures described in the Integrated Natural Resource Management Plan (INRMP).

5.3.5 Biological Resource Impacts at UTMB

CBDP activities at UTMB have negligible adverse impacts on plant and animal ecology in the Galveston area. Escape of a laboratory animal, healthy or infected, would be highly unlikely because of the design of the physical facilities in accordance with benchmark guidelines described in Section 2.3.5.1.c and use of SOPs, as described in Section 2.4.6.3.a. The facilities where laboratory animals are housed have barriers to reduce the likelihood of animal escape, including self-closing doors, sealed wall penetrations, lack of windows, and species-appropriate systems. The probability that an animal bred for laboratory research could escape and survive in the urban setting is extremely remote. No such escapes have been recorded at UTMB.

A number of federally and state-listed endangered or threatened species have been identified for Galveston County (see Section 4.6.2.3). These biological resources are located far from any CBDP activities at UTMB.

5.3.6 Biological Resource Impacts at BMI, West Jefferson

CBDP activities at BMI have negligible to minor adverse impacts on plant and animal ecology in the West Jefferson area. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.7.3.a. Furthermore, the etiologic agents used in CBDP RDT&E activities at BMI do not cause plant disease.

Escape of a laboratory animal, healthy or infected, would be highly unlikely because of the design of the physical facilities in accordance with benchmark guidelines described in Section 2.3.5.1.c and use of SOPs, as described in Section 2.4.7.3.a. The facilities where laboratory animals are housed have barriers to reduce the likelihood of animal escape, including self-closing doors, sealed wall penetrations, lack of windows, and species-appropriate systems. The

probability that an animal bred for laboratory research could escape and survive in the wild is extremely remote. No such escapes have been recorded at BMI.

Big Darby Creek, which is adjacent to the eastern portion of the site, provides habitat for federally and state-listed endangered/threatened species and special status species. BMI impacts on water quality in this stream are minor and mitigated by adherence to the on-site wastewater treatment plant (WWTP) National Pollutant Discharge Elimination System (NPDES) permit requirements.

5.3.7 Biological Resource Impact Summarization

CBDP activities at the example sites have negligible adverse impacts on local plant and animal ecology. A release of biological toxin, chemical agent, or HAP during aerosol testing would be highly improbable because of the engineering controls and SOPs described in Section 2.4.1.3.a. Furthermore, the etiologic agents used in CBDP RDT&E activities do not cause plant disease.

Escape and survival of a laboratory animal, healthy or infected, would be highly unlikely. The design of the physical facilities in accordance with benchmark guidelines described in Section 2.3.5.1.c and use of SOPs minimize the possibility of escape. No such escapes have been recorded at the example sites.

Site-specific management plans for the military installations mitigate impacts on identified species of concern.

5.4 Analysis of Cultural Resource Impacts of CBDP Activities at the Example Sites

Cultural resources include historically important buildings and archaeological sites. CBDP activities have the potential to impact cultural resources through waste management impacts or safety, health, and security impacts such as release of a corrosive chemical or escape of a laboratory animal. Impacts of construction activities are not included in the scope of the analysis (see Section 3.3).

5.4.1 Cultural Resource Impacts at ECBC and USAMRICD (APG)

Adverse impacts on historical or archaeological resources at ECBC and USAMRICD are mitigated by adherence to the Cultural Resource Management Plan, in accordance with Army regulations. As noted in Section 4.2.3, ECBC and USAMRICD facilities do not lie adjacent to any of the 8 historically significant sites on the Edgewood Area of APG (2 National Register of Historic Places [NRHP]-listed sites, 1 site nominated for the NRHP, and 5 additional sites considered eligible for nomination). At least 20 known or suspected archaeological sites are located near the ECBC and USAMRICD facilities on the Edgewood Area of APG. The APG Cultural Resource Manager and the Maryland State Historic Preservation Office must approve any renovation or construction activities planned for ECBC or USAMRICD to prevent any negative impact on area archaeological resources.

One ECBC and two USAMRICD buildings that house CBDP activities are considered historically important as illustrative of military activities during the cold war. Current CBDP

activities and similar activities performed for more than 20 years in these buildings have not damaged or otherwise negatively impacted the structures.

5.4.2 Cultural Resource Impacts at NSWCDL

Adverse impacts on historical or archaeological resources have not occurred at NSWCDL. It is very unlikely that CBDP RDT&E activities, which are conducted indoors in facilities that were designed for this type of use, would release corrosive chemicals. As noted in Section 4.3.3, the Chemical and Biological Defensive Warfare Laboratory (CBL) Building does not lie adjacent to any of the four historic districts on NSWCDL. Two known archaeological sites are located adjoining the CBL Building, and extensive archaeological sites are nearby. Any action that may disturb a known or suspected archaeological site must be coordinated with the Safety and Environmental Office and the Cultural Resource Manager, in accordance with the installation's INRMP.

5.4.3 Cultural Resource Impacts at USAMRIID

Adverse impacts on historical or archaeological resources at USAMRIID are mitigated by adherence to the Cultural Resource Management Plan, in accordance with Army regulations. It is very unlikely that CBDP RDT&E activities, which are conducted indoors in facilities that were designed for this type of use, would release corrosive chemicals or that laboratory animals capable of harming structures would escape and survive. As noted in Section 4.4.3, the USAMRIID CBDP buildings do not lie adjacent to any of the four NRHP-listed sites on Area A of Fort Detrick. One of the main USAMRIID buildings is considered historically important as illustrative of military activities during the cold war and eligible for the NRHP. Current CBDP activities and similar activities performed for more than 30 years in this building have not damaged or otherwise negatively impacted the structure. This building is adjoined by a non-USAMRIID building that also has been designated as NRHP-eligible and historically important as illustrative of military activities during the cold war. The three significant archaeological sites on Area A of Fort Frederick are not located near the USAMRIID facilities. The Fort Detrick U.S. Army Garrison Cultural Resource Manager and the Maryland State Historic Preservation Office must approve any renovation or construction activities planned for the installation to prevent any negative impact on area archaeological resources.

5.4.4 Cultural Resource Impacts at DPG

Adverse impacts on historical or archaeological resources at DPG are mitigated by adherence to the Cultural Resource Management Plan, in accordance with Army regulations. It is very unlikely that the CBDP RDT&E activities would release corrosive chemicals or that laboratory animals capable of harming structures would escape and survive. As noted in Section 4.5.3, the DPG CBDP facilities do not lie adjacent to the one NRHP-listed site on DPG. Several of the buildings that house CBDP activities are considered historically important as illustrative of military activities during the cold war and eligible for the NRHP. Current CBDP activities and similar activities performed for more than 40 years in these buildings have not damaged or otherwise negatively impacted the structures. Over 200 archaeological sites have been identified on the installation.

5.4.5 Cultural Resource Impacts at UTMB

Adverse impacts on historical or archaeological resources have not occurred at UTMB. It is very unlikely that CBDP RDT&E activities, which are conducted indoors in facilities that were designed for this type of use, would release corrosive chemicals or that laboratory animals capable of harming structures would escape and survive. As noted in Section 4.6.3, UTMB CBDP facilities do not lie adjacent to any of the historic campus buildings registered by the State of Texas or any of the numerous NRHP-listed historical sites near the UTMB campus.

5.4.6 Cultural Resource Impacts at BMI, West Jefferson

As noted in Section 4.7.3, there are no known archaeological sites or historic properties listed or eligible for listing in the NRHP on or near the BMI West Jefferson site.

5.4.7 Cultural Resource Impact Summarization

Adverse impacts on historical or archaeological resources at the example sites are negligible. It is very unlikely that CBDP RDT&E activities, which are conducted indoors in facilities that were designed for this type of use, would release corrosive chemicals or that laboratory animals capable of harming structures could escape and survive.

Impacts on historical or archaeological resources are mitigated at military installations by adherence to Cultural Resource Management Plans or INRMPs, in accordance with service regulations. At public sector installations, such impacts are mitigated by adherence to federal and state laws concerning historical preservation.

Certain military installation buildings that house CBDP activities are considered historically important for activities that took place during the cold war. Current and past CBDP activities performed in these building have not damaged or otherwise negatively impacted these structures.

5.5 Analysis of Earth Resource Impacts of CBDP Activities at the Example Sites

Earth resources are characterized in terms of topography, geology, soils, and seismic activity, as noted in Section 4.1.4. CBDP activities have the potential to impact soils through waste management impacts from on-site waste disposal or by release of biological toxins or chemicals. The impacts of such potential releases on other attributes, such as water resources, vary depending on the Earth resources. Impacts of construction activities, such as soil erosion, are not included in the scope of the analysis (see Section 3.3).

5.5.1 Earth Resource Impacts at ECBC and USAMRICD (APG)

CBDP activities at ECBC and USAMRICD have negligible adverse impacts on Earth resources. There is no on-site disposal of waste (see Section 2.4.2.2.c), and the former landfill on the Edgewood Area of APG was undergoing closure during 2002. Furthermore, CBDP activities at ECBC and USAMRICD are estimated to account for a small fraction of the APG nonhazardous solid waste disposed off site at the Harford County Landfill. Potential adverse impacts on soils due to release of a biological toxin or chemical agent from CBDP activities are mitigated by

adherence to SOPs. Seismic hazards at ECBC and USAMRICD are not likely to be significant, as indicated in Section 4.2.4.4.

5.5.2 Earth Resource Impacts at NSWCDL

CBDP activities at NSWCDL have negligible adverse impacts on Earth resources. There is no on-site disposal of waste (see Section 2.4.3.2.c). Furthermore, CBDP activities at NSWCDL are estimated to account for approximately 1% of the installation's nonhazardous solid waste disposed off site at the King George County Landfill. Potential adverse impacts on soils due to release of a biological toxin or chemical agent from CBDP activities are mitigated by adherence to SOPs. Seismic hazards at NSWCDL are not likely to be significant, as indicated in Section 4.3.4.4.

5.5.3 Earth Resource Impacts at USAMRIID

CBDP activities at USAMRIID have negligible adverse impacts on Earth resources. The on-site disposal of waste (see Section 2.4.4.2.c) occurs on Area B of Fort Detrick, far from the main USAMRIID CBDP facilities. Any impacts from this disposal are mitigated by adherence to requirements under the state waste disposal permit. Furthermore, CBDP activities at USAMRIID are estimated to account for approximately 7% of the installation's nonhazardous solid waste disposal. Potential adverse impacts on soils due to release of a biological toxin or chemical agent from CBDP activities are mitigated by adherence to SOPs. Seismic hazards at USAMRIID are not likely to be significant, as indicated in Section 4.4.4.4.

5.5.4 Earth Resource Impacts at DPG

CBDP activities at DPG have negligible adverse impacts on Earth resources. The on-site disposal of waste (see Section 2.4.5.2.c) occurs in the English Village area, far from the various CBDP facilities. Any impacts from this disposal are mitigated by adherence to requirements under the state waste disposal permit. Seismic hazards at DPG are not likely to be significant, as indicated in Section 4.5.4.4.

Potential adverse impacts on soils due to release of a biological toxin or chemical agent from indoor CBDP activities are mitigated by engineering controls and by adherence to SOPs. Chemical and biological (CB) simulants used for outside testing are not expected to pose a significant impact on soil. The biological simulants are microorganisms commonly found in soils or other natural settings or biological toxins that can readily be broken down by soil fauna. VOC and gaseous chemical simulants used at DPG should evaporate, leaving negligible residue. The alkaline nature of the soils at DPG discourages adsorption of organic compound chemical simulants.

5.5.5 Earth Resource Impacts at UTMB

CBDP activities at UTMB have negligible adverse impacts on Earth resources. There is no on-site disposal of waste (see Section 2.4.6.2.c). Furthermore, CBDP activities at UTMB are estimated to account for only about 0.01% of the institution's nonhazardous solid waste disposal. Potential adverse impacts on soils due to release of a biological toxin or chemical agent from

CBDP activities are mitigated by adherence to SOPs. Seismic hazards at UTMB are not likely to be significant, as indicated in Section 4.6.4.4.

5.5.6 Earth Resource Impacts at BMI, West Jefferson

CBDP activities at BMI have negligible adverse impacts on Earth resources. There is no on-site disposal of waste (see Section 2.4.7.2.c). CBDP activities are believed to account for most of BMI's nonhazardous solid waste. BMI solid waste comprises less than 0.01% of the total solid waste disposed at the Franklin County Landfill. Potential adverse impacts on soils due to release of a biological toxin or chemical agent from CBDP activities are mitigated by adherence to SOPs. Seismic hazards at BMI are not likely to be significant, as indicated in Section 4.7.4.4.

5.5.7 Earth Resource Impact Summarization

The impacts of CBDP activities at the example sites on soils are negligible. Potential waste management impacts from land disposal of waste are mitigated by adherence to the waste disposal permit requirements of the landfill. Such impacts are further mitigated by adherence to the benchmark regulations and guidance presented in Section 2.3.4.2 for military installations, as well as by applicable state regulations. Seismic hazards, which are inherently site specific, are not likely to be significant at any of the example sites.

5.6 Analysis of Land Use Impacts of CBDP Activities at the Example Sites

Potential land use impacts of CBDP activities comprise impairment of existing uses on and adjoining the installations through waste management impacts or safety, health, and security impacts. Land use impacts associated with construction, including accordance with land use regulations and conformance to local topography, are not included in the scope of this analysis (see Section 3.3).

5.6.1 Land Use Impacts at ECBC and USAMRICD (APG)

Potential impacts on land use due to ECBC and USAMRICD CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations presented in Section 2.3.4 and site-specific regulations and SOPs listed in Sections 2.4.1.2.c. and 2.4.2.2.c. The Installation Master Plan locates CBDP RDT&E activities in an area of APG designated for research and development. Land use at APG is restricted on portions of the installation that were contaminated by historical testing activities (previous to the CBDP) of ordnance and/or chemical agents, or by waste disposal practices for residues from these testing activities, as noted in Section 4.2.5.

5.6.2 Land Use Impacts at NSWCDL

Potential impacts on land use due to NSWCDL CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations presented in Section 2.3.4 and site-specific regulations and SOPs listed in Section 2.4.3.2.c. CBDP activities do not conflict with land use in the adjacent Advanced Concepts Complex, which includes buildings that support RDT&E functions (see Section 4.3.5).

5.6.3 Land Use Impacts at USAMRIID

Potential impacts on land use due to USAMRIID CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations presented in Section 2.3.4 and site-specific regulations and SOPs listed in Section 2.4.4.2.c. USAMRIID CBDP activities do not conflict with adjacent land use in the central portion of Area A of Fort Detrick, which includes industrial buildings and RDT&E complexes (see Section 4.4.5).

5.6.4 Land Use Impacts at DPG

Potential impacts on land use due to DPG CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations presented in Section 2.3.4 and site-specific regulations and SOPs listed in Section 2.4.5.2.c. CBDP activities do not conflict with adjacent land use within the installation (see Section 4.5.5).

5.6.5 Land Use Impacts at UTMB

Potential impacts on land use due to UTMB CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations presented in Section 2.3.4 and site-specific regulations and SOPs listed in Section 2.4.6.2.c. CBDP activities do not conflict with adjacent land use within the UTMB campus and the surrounding developed nonresidential areas of the City of Galveston.

5.6.6 Land Use Impacts at BMI, West Jefferson

Potential impacts on land use due to BMI CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations presented in Section 2.3.4 and site-specific regulations and SOPs listed in Section 2.4.7.2.c. CBDP activities do not conflict with adjacent land use within the BMI West Jefferson site, which includes agricultural land, Battelle Lake, and buildings that support RDT&E (see Section 4.7.5).

5.6.7 Land Use Impact Summarization

Potential impacts on land use due to CBDP activities, such as release of a biological toxin or chemical agent, are negligible and mitigated by adherence to the benchmark guidelines and regulations for waste management presented in Section 2.3.4 and site-specific regulations and SOPs listed in Section 2.4. CBDP activities at the examples sites do not conflict with existing and planned adjacent land use on or bordering the installations.

5.7 Analysis of Noise Impacts of CBDP Activities at the Example Sites

Noise impacts may affect the health of the workforce and residents and may potentially modify the behavior of domestic animals and wildlife. The environmental analysis for noise impacts at the example sites includes citizen and worker complaints.

5.7.1 Noise Impacts at ECBC and USAMRICD (APG)

CBDP activities at ECBC and USAMRICD produce insignificant levels of noise relative to the weapons testing and aviation activities elsewhere at APG, as indicated in Section 4.2.6.

5.7.2 Noise Impacts at NSWCDL

CBDP activities at NSWCDL produce no discernible noise above ambient levels, as indicated in Section 4.3.6.

5.7.3 Noise Impacts at USAMRIID

CBDP activities at USAMRIID produce insignificant levels of noise relative to the shop and industrial facility, generator, helicopter operation, and vehicular traffic activities elsewhere at Fort Detrick, as indicated in Section 4.4.6. No significant complaints regarding noise from USAMRIID operations have been received since 1991.

5.7.4 Noise Impacts at DPG

CBDP activities at DPG produce minimal levels of noise relative to the aircraft operations and detonations or artillery firing with conventional munitions operations elsewhere on DPG, as indicated in Section 4.5.6.

5.7.5 Noise Impacts at UTMB

No complaints regarding noise have been reported at UTMB since 1995 (see Section 4.6.6).

5.7.6 Noise Impacts at BMI, West Jefferson

The only recent complaint regarding noise originating from the BMI West Jefferson site concerned an accidental explosion in 1995 that startled nearby neighbors. The explosion occurred at a BMI facility unrelated to CBDP activities, as noted in Section 4.7.6.

5.7.7 Noise Impact Summarization

CBDP activities do not inherently produce excessive levels of noise. Noise impacts of CBDP activities at the example sites have been insignificant. Site-specifically where recorded, no noise complaints were documented from 1996 through 2001.

5.8 Analysis of Socioeconomic and Environmental Justice Impacts of CBDP Activities at the Example Sites

Analysis of impacts on the socioeconomic and environmental justice attributes includes consideration of economic activity, income, population, demographics, and housing. This includes direct impacts (employment and business opportunities) provided by CBDP activities and secondary waste management or safety, health, and security impacts attributable to CBDP activities such as odors, air emissions, noise, etc.

5.8.1 Socioeconomic and Environmental Justice Impacts at ECBC and USAMRICD (APG)

CBDP RDT&E activities at ECBC and USAMRICD account for approximately 9.2% of the total employment at APG, a significant beneficial impact for Harford County (see Section 4.2.7.1). Adverse indirect socioeconomic impacts of these CBDP activities on areas adjacent to the Edgewood Area of APG have been negligible to minor. On balance, the socioeconomic impact is rated beneficial and minor. Since these areas are not characterized by poverty or significant minority populations, as shown in Section 4.2.7, CBDP activities at ECBC and USAMRICD have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.8.2 Socioeconomic and Environmental Justice Impacts at NSWCDL

NSWCDL has an important role in the economy of King George County, as indicated in Section 4.3.7.1. CBDP activities account for approximately 1.7% of employment at NSWCDL, a minor economic benefit for the County. Adverse indirect socioeconomic impacts of these CBDP activities on areas adjacent to the installation have been negligible to minor. On balance, the socioeconomic impact is rated beneficial and negligible. Since these areas are not characterized by poverty or significant minority populations, as shown in Section 4.3.7, CBDP activities at NSWCDL have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.8.3 Socioeconomic and Environmental Justice Impacts at USAMRIID

USAMRIID accounts for approximately 9.0% of the total employment at Fort Detrick, a significant beneficial impact for Frederick County (see Section 4.4.7.1). Adverse indirect socioeconomic impacts of these CBDP activities on areas adjacent to the installation have been negligible to minor. On balance, the socioeconomic impact is rated beneficial and minor. Since these areas are not characterized by poverty or significant minority populations, as shown in Section 4.4.7, CBDP activities at USAMRIID have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.8.4 Socioeconomic and Environmental Justice Impacts at DPG

DPG is the largest employer in Tooele County, as noted in Section 4.5.7.1, a significant benefit for the County. Adverse indirect socioeconomic impacts of these CBDP activities at DPG on areas adjacent to the installation have been negligible to minor. On balance, the socioeconomic impact is rated beneficial and minor. Since these areas are remote from CBDP activity sites and are not characterized by poverty or significant minority populations, as shown in Section 4.5.7, the CBDP activities at DPG have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.8.5 Socioeconomic and Environmental Justice Impacts at UTMB

Personnel assigned to the biological containment laboratories comprise approximately 0.3% of the total UTMB employment, a minor economic benefit for the Galveston area. Adverse indirect socioeconomic impacts of these CBDP activities on areas adjacent to the campus have been negligible. On balance, the socioeconomic impact is rated beneficial and negligible. Since these

areas are not characterized by poverty or significant minority populations, as shown in Section 4.6.7, CBDP activities at UTMB have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.8.6 Socioeconomic and Environmental Justice Impacts at BMI, West Jefferson

CBDP activities are a significant portion of the total employment at BMI, a minor beneficial impact for Madison County. Adverse indirect socioeconomic impacts of these CBDP activities on areas adjacent to the institution have been negligible. On balance, the socioeconomic impact is rated beneficial and minor. Since these areas are not characterized by poverty or significant minority populations, as shown in Section 4.7.7, CBDP activities at BMI have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.8.7 Socioeconomic and Environmental Justice Impact Summarization

CBDP RDT&E activities at the example sites, on balance, provide negligible to minor beneficial local socioeconomic and environmental justice impacts. Employment and economic activity attributable to CBDP benefit the local economies. Adverse indirect socioeconomic impacts of these CBDP activities on areas adjacent to the installations have been negligible. Since these areas are not characterized by poverty or significant minority populations, CBDP activities at the example sites have not resulted in disproportionate adverse impacts on minority or low-income populations.

5.9 Analysis of Transportation and Airspace Impacts of CBDP Activities at the Example Sites

CBDP activities may impact transportation resources through vehicular traffic attributable to commuting workers, visitors, and vendor deliveries. Impacts on railroads, aviation and airspace, and marine transportation would likely be negligible.

The scope of the environmental analysis also includes potential release during shipment of a biological toxin or chemical agent to and from the example sites. Transportation of etiologic and chemical agents must be conducted in accordance with benchmark guidance and regulations for Biological Safety, as enumerated in Section 2.3.5.1. Similarly, transportation of chemical agents must be conducted in accordance with benchmark guidance and regulations for Chemical Surety and Chemical Safety, as enumerated in Sections 2.3.3 and 2.3.5.2, respectively. These regulations have been promulgated to protect workers engaged in handling and/or shipping etiologic and chemical agents at shipment and delivery sites, as well as to protect the public health in the event of accidents or mishaps in transit. There have been no documented cases of illness associated with the transport of etiologic agents (World Health Organization 1997).

5.9.1 Transportation and Airspace Impacts at ECBC and USAMRICD (APG)

CBDP activities at ECBC and USAMRICD have minor impacts on transportation resources in the Edgewood region of APG. Workers in these activities account for approximately 9.1% of commuter traffic at APG, based on employment data presented in Section 4.2.7.1. As indicated in Section 4.2.8.1, several gates to the Edgewood Area are available, but traffic studies showed

that the access road to the main gate was at or near saturation. Existing roads inside the Edgewood Area of APG at ECBC and USAMRICD are adequate to accommodate current traffic.

The killed etiologic agents used at ECBC within the CBDP include a variety of Centers for Disease Control and Prevention (CDC)-listed select agents. This is important, as the killed organism will not pose a risk for public health in the event of a transportation accident during shipment. A certificate from the supplier must accompany killed pathogens procured by ECBC to ensure that the shipment is free of living organisms, in accordance with ECBC SOPs, as noted in Section 2.4.1.3.a.

5.9.2 Transportation and Airspace Impacts at NSWCDL

CBDP activities at NSWCDL have negligible impacts on transportation resources at the installation. Workers in these activities account for approximately 1.6% of commuter traffic at NSWCDL, based on employment data presented in Section 4.3.7.1. The installation is located in a rural area, and two gates are available, as indicated in Section 4.3.8.1.

Shipment of etiologic agents to and from NSWCDL must be conducted in accordance with the benchmark regulations listed in Section 2.3.5.1.d.

5.9.3 Transportation and Airspace Impacts at USAMRIID

CBDP activities at USAMRIID have minor impacts on transportation resources at Fort Detrick. USAMRIID workers account for approximately 9.0% of commuter traffic at the installation, based on employment data presented in Section 4.4.7.1. The main gate is located on heavily traveled city streets, although access to USAMRIID is available through three alternate gates, as indicated in Section 4.4.8.1.

Shipment of etiologic agents to and from USAMRIID must be conducted in accordance with the benchmark regulations listed in Section 2.3.5.1.d, as well as Army Regulation (AR) 385-69 and Department of the Army (DA) Pamphlet (PAM) 385-69. USAMRIID is registered with CDC for shipment of select agents, in accordance with 42 *Code of Federal Regulations* (CFR) 72.6, as noted in Section 2.4.4.3.a.

5.9.4 Transportation and Airspace Impacts at DPG

CBDP activities at DPG have negligible impacts on transportation resources at the installation. Workers in these activities account for approximately 1.6% of commuter traffic at DPG, based on employment data presented in Section 4.5.7.1. The installation is located in a rural area, although visitors and commuting CBDP workers would likely have to enter through the main gate, as indicated in Section 4.5.8.1.

Shipment of etiologic agents to and from DPG must be conducted in accordance with AR 385-69 and DA PAM 385-69, as well as the benchmark regulations listed in Section 2.3.5.1.d. Most shipments of chemical agents arrive at DPG on military aircraft under technical escort and are met by both Ammunition Accountability Branch and Technical Escort Unit personnel, in accordance with DA PAM 50-6, as noted in Section 2.4.5.3.c.

5.9.5 Transportation and Airspace Impacts at UTMB

CBDP activities at UTMB have negligible impacts on transportation resources at the campus. Workers in these activities account for approximately 0.25% of commuter traffic at UTMB, based on employment data presented in Section 4.6.7.1 and personnel assignments listed in Section 2.4.6. However, the UTMB campus is located in the central part of the City of Galveston, as indicated in Section 4.6.8.1.

The *University of Texas Medical Branch Safety Manual* provides guidelines for the handling of biological agents, including shipment of hazardous agents, as noted in Section 2.4.6.3.a.

5.9.6 Transportation and Airspace Impacts at BMI, West Jefferson

CBDP activities at BMI have negligible impacts on transportation resources at the site. Workers in these activities account for most of the commuter traffic at BMI. Only one gate is available for highway access, but the West Jefferson complex is located in a rural area, as indicated in Section 4.7.8.1.

BMI is registered with CDC for shipment of select agents, in accordance with 42 CFR 72.6, as noted in Section 2.4.7.3.a.

5.9.7 Transportation and Airspace Impact Summarization

The impacts of CBDP activities on local transportation resources at the example sites are site specific. Impacts of commuting workers, visitors, and vendor deliveries are negligible to minor, depending on the percentage of employees engaged in CBDP activities and site-specific factors related to roadway capacity and access alternatives.

The impact of a potential release during shipment of a biological toxin or chemical agent to or from the example sites is mitigated by adherence to benchmark guidance and regulations noted above and to site-specific SOPs.

5.10 Analysis of Utilities Impacts of CBDP Activities at the Example Sites

The utilities attribute includes facilities and infrastructure for fuels, electrical power, and water supply, as noted in Section 4.1.9. CBDP activities contribute to the demand for these utilities. CBDP RDT&E facilities (CB containment laboratories, animal containment laboratories, and animal holding facilities) are power-intensive because of the requirements for ventilation systems and directional airflow.

5.10.1 Utilities Impacts at ECBC and USAMRICD

The utilities impacts of CBDP activities at ECBC and USAMRICD are minor. These activities are estimated to account for approximately three-quarters of the power usage at the Edgewood Area of APG, but only a minor fraction of the water consumption. These qualitative assessments are based on extrapolation of the estimates for USAMRICD presented in Section 2.4.2.2.a (approximately 25% of the power usage for the Edgewood Area of APG, but only approximately 0.3% of the water usage). As indicated in Sections 2.4.1.2.a and 2.4.2.2.a, the utility usage for

CBDP activities at ECBC and USAMRICD cannot be determined precisely, because individual buildings are not metered. Fuel consumption for the CBDP activities at ECBC and USAMRICD is believed to account for a minor fraction of the total fuel requirements for the Edgewood Area of APG, since the heating system uses steam from the Harford County WEP.

5.10.2 Utilities Impacts at NSWCDL

The utilities impacts of CBDP activities at NSWCDL are negligible. These activities account for approximately 1% to 2% of power, fuel, and potable water usage at the installation, based on estimates cited in Section 2.4.3.2.a.

5.10.3 Utilities Impacts at USAMRIID

The utilities impacts of CBDP activities at USAMRIID are minor. These activities account for approximately 7.5% of the electrical power consumption and 13% of potable water usage at Fort Detrick, based on estimates cited in Section 2.4.4.2.a. However, the estimated fuel usage for CBDP activities is approximately 1% of the installation total.

5.10.4 Utilities Impacts at DPG

The utilities impacts of CBDP activities at DPG are minor. These activities account for approximately 25% of the electrical power consumption, 18% of the potable water, and 16% of fuel usage at DPG, based on estimates cited in Sections 2.4.5.2.a. and 2.4.5.2.c.

5.10.5 Utilities Impacts at UTMB

The utilities impacts of CBDP activities at UTMB are negligible. These activities account for less than 1% of power, fuel, and potable water usage at UTMB, based on estimates cited in Section 2.4.6.2.a.

5.10.6 Utilities Impacts at BMI, West Jefferson

The utilities impacts of CBDP activities at BMI are minor. These activities account for more than 90% of the electrical power consumption at BMI, based on estimates cited in Section 2.4.7.2.a. However, the 281,465-kilowatt-hour per year total for BMI is a small fraction of the regional capacity provided by American Electric Power. CBDP activities are believed to account for significant fractions of the potable water and fuel consumption, although estimates were not available.

5.10.7 Utilities Impact Summarization

The utility requirements for CBDP activities at the example sites are site specific. At the military installations and UTMB, as a large academic research center, electrical power, fuel, and potable water usage for CBDP activities have a negligible to minor impact on the total utility requirements. At a small, specialized private research institute, such as BMI, the CBDP activities account for most of the local utility requirements, but the regional utility impacts are minor.

5.11 Analysis of Water Resource Impacts of CBDP Activities at the Example Sites

CBDP activities have the potential to impact water resources through water supply utility demands and water pollutant discharges. Impacts of construction activities are not included in the scope of the analysis (see Section 3.3).

5.11.1 Water Resource Impacts at ECBC and USAMRICD (APG)

CBDP activities are believed to have a minor impact on water resources at the Edgewood Area of APG. It is not known precisely how much wastewater is contributed by CBDP activities at ECBC and USAMRICD of the approximately 3,028,320-liter (800,000-gallon) per day total sanitary wastewater load of the Edgewood Area WWTP, because individual facility discharges into the central sanitary sewer are not metered. The impacts of the CBDP-generated wastewater on surface water quality are mitigated by adherence to the benchmark guidelines and regulations listed in Section 2.3.4.3; the APG SOPs for wastewater management, discussed in Sections 2.4.1.2.c. and 2.4.2.2.c; and the permit requirements for the 7,570,800-liter (2-million-gallon) per day capacity Edgewood Area WWTP. Past activities at certain facilities in the Edgewood Area of APG have led to contamination in their nearby surface water and groundwater sources, as discussed in Section 4.2.10. However, adverse impacts on groundwater resources and wetlands from current CBDP activities are insignificant, since the only discharge of wastewater is treated effluent into the Bush River.

5.11.2 Water Resource Impacts at NSWCDL

CBDP activities have a negligible impact on water resources at NSWCDL. CBDP activities are estimated to account for approximately 1% of the 1,177,259-liter (311,000-gallon) per day total sanitary wastewater load of the installation's WWTP. The impacts of the CBDP-generated wastewater on surface water quality are mitigated by adherence to the benchmark guidelines and regulations listed in Section 2.3.4.3; the NSWCDL SOPs for wastewater management, discussed in Section 2.4.3.2.c; and the permit requirements for the WWTP. Adverse impacts on groundwater resources and wetlands from current CBDP activities are negligible, since the only discharge of wastewater is treated effluent into Upper Machodoc Creek. Storm-water runoff from industrial areas of the installation discharges into Upper Machodoc Creek and Gambo Creek, subject to permit requirements.

5.11.3 Water Resource Impacts at USAMRIID

CBDP activities at USAMRIID have a negligible to minor impact on water resources at Fort Detrick. These CBDP activities are estimated to account for approximately 7.2% of the 3,599,915-liter (951,000-gallon) per day average total sanitary wastewater load of the installation's WWTP. The impacts of the CBDP-generated wastewater on surface water quality are mitigated by adherence to the benchmark guidelines and regulations listed in Section 2.3.4.3; the USAMRIID SOPs for wastewater management, discussed in Section 2.4.4.2.c; and the permit requirements for the 4,542,480-liter (1,200,000-gallon) per day capacity WWTP. Adverse impacts on groundwater resources and wetlands from current CBDP activities are not significant, since the only discharge of wastewater is treated effluent into the Monocacy River. Fort Detrick discharges of storm-water runoff into tributaries of the Monocacy River are subject to permit requirements.

5.11.4 Water Resource Impacts at DPG

CBDP activities at DPG have a minor impact on water resources at the installation. These CBDP activities are estimated to account for approximately 18% of the estimated 567,810-liter (150,000-gallon) per day average total sanitary wastewater load of the installation's four wastewater treatment lagoons, all of which discharge to groundwater (see Section 2.4.5.2.c). The impacts of the CBDP-generated wastewater on groundwater quality are mitigated by adherence to the benchmark guidelines and regulations listed in Section 2.3.4.3; the DPG SOPs for wastewater management, discussed in Section 2.4.5.2.c; and the permit requirements for the 465,604-liter (123,000-gallon) per day capacity English Village lagoon.

5.11.5 Water Resource Impacts at UTMB

CBDP activities at UTMB are believed to have a negligible impact on water resources in Galveston. It is estimated that less than 1% of UTMB's 2,081,970-liter (550,000-gallon) per day total sanitary wastewater discharges into the City of Galveston sewer system is contributed by these activities, based on water supply estimates discussed in Section 2.4.6.2.a. The impacts of the CBDP-generated wastewater on surface water quality are mitigated by adherence to the benchmark guidelines and regulations listed in Section 2.3.4.3; the UTMB SOPs for wastewater management, discussed in Section 2.4.6.2.c; and the indirect discharge permit requirements under the city's industrial waste pretreatment program. Adverse impacts on groundwater resources and wetlands from current CBDP activities are negligible, since the only discharge of wastewater is into the sewer system.

5.11.6 Water Resource Impacts at BMI, West Jefferson

CBDP activities have a minor impact on water resources near BMI, West Jefferson. These CBDP activities are estimated to account for approximately 85% of the 2,222,030-liter (587,000-gallon) per day average total sanitary wastewater load of the installation's WWTP. The impacts of the CBDP-generated wastewater on surface water quality are mitigated by adherence to the benchmark guidelines and regulations listed in Section 2.3.4.3; the BMI SOPs for wastewater management, discussed in Section 2.4.7.2.c; and the NPDES permit requirements for the WWTP. Adverse impacts on groundwater resources and wetlands from current CBDP activities are not significant, since the only discharge of wastewater is treated effluent into Big Darby Creek.

5.11.7 Water Resource Impact Summarization

Potential impacts of CBDP activities on surface water resources, groundwater, and wetlands are negligible to minor and are mitigated by adherence to the benchmark guidelines and regulations for waste management mitigation discussed in Section 2.3.4 and for safety, health, and security mitigation discussed in Section 2.3.5.

5.12 Analysis of Safety, Health, and Security Impacts of CBDP Activities at the Example Sites

CBDP activities involve potential exposure to etiologic agents capable of causing human disease or to chemical agents capable of killing, seriously injuring, or incapacitating humans. The

environmental analysis considers risks to both workers (occupational health and safety) and the public health and safety. Security issues—intentional unauthorized removal of highly hazardous CB materials for purposes of terrorism—are addressed in Section 2 under Chemical Surety Materiel, Biological Safety, and Chemical Safety, as well as under the physical security discussions.

Inherent risks for workers resulting from exposure to etiologic agents, infected laboratory animals, or chemical agents associated with their CBDP activities are mitigated by adherence to the benchmark guidelines and regulations for safety, health, and security mitigation discussed in Section 2.3.5. Carefully considered and applied engineering and work practice controls for containment minimize worker exposure, and systematic medical monitoring is required. An LAI or chemical injury indicates a breach of the mitigation measures.

Risks to public health and safety resulting from release of etiologic agents, escape of infected laboratory animals, or release of chemical agents associated with CBDP activities are further mitigated by adherence to the benchmark guidelines and regulations for waste management mitigation discussed in Section 2.3.4, in addition to those for safety, health, and security mitigation. Decontamination of potentially infectious or chemically contaminated air emissions and liquid or solid waste followed by environmentally safe disposal prevent or minimize release of etiologic or chemical agents to the environment and potential public exposure.

The analytic tools of hazard analysis have been used in this programmatic environmental impact statement (PEIS) to help determine the CBDP activity risk of exposure to the public resulting from accidental release of an etiologic or chemical agent. Appendix B describes the hazard analyses, including a number of maximum credible event (MCE) analyses covering a wide array of potential hazard scenarios for CBDP activities. The purpose of these analyses is to create robust models that can be extended to CBDP activities performed at any location. To the extent that site-specific information was required for computer simulation models conducted as part of the MCE analyses, example-site data was used and is identified, where applicable. As demonstrated in Appendix B, the probabilities of adverse impacts on human health and the environment occurring are remote, given the operational and facility safeguards required; to date, there have been no such incidents associated with CBDP activities.

5.12.1 Safety, Health, and Security Impacts at ECBC and USAMRICD (APG)

A representative list of the etiologic and chemical agents used in CBDP activities at ECBC appears in Section 2.4.1.1. Mitigation measures for safety, health, and security are presented in Section 2.4.1.3. ECBC had two chemical accidents, one in 1999 and one in 2000, in the performance of CBDP-related activities from 1997 through 2001. No biological mishaps or other chemical accidents occurred at ECBC during this 5-year period (see Section 2.4.1.3.b). On that basis, the safety and health impacts for ECBC were rated as minor.

A representative list of the etiologic and chemical agents used in CBDP activities at USAMRICD appears in Section 2.4.2.1. Mitigation measures for safety, health, and security are presented in Section 2.4.2.3. No biological mishaps or chemical accidents occurred from 1997

through 2001 in CBDP-related activities at USAMRICD (see Section 2.4.2.3.b). On that basis, the safety and health impacts for USAMRICD were rated as negligible.

5.12.2 Safety, Health, and Security Impacts at NSWCDL

No LAIs were reported for CBDP activities at NSWCDL from 1997 through 2001 (see Section 2.4.3.3.b). On that basis, the safety and health impacts for NSWCDL were rated as negligible.

5.12.3 Safety, Health, and Security Impacts at USAMRIID

A representative list of etiologic agents used at USAMRIID is provided in Section 2.4.4.1. Two LAIs resulting from the conduct of CBDP activities were recorded at USAMRIID within the 5-year period 1997 through 2001 (see Section 2.4.4.3.b). On that basis, the safety and health impacts for USAMRIID were rated as minor. Unsubstantiated allegations of security breaches at USAMRIID, intentional removal of biological agents for terrorist purposes, appeared in the media during 2001.

5.12.4 Safety, Health, and Security Impacts at DPG

DPG had no recorded chemical injuries or LAIs during the performance of CBDP-related activities from 1997 through 2001 (see Sections 2.4.5.3 and 2.4.5.3.b). On that basis, the safety and health impacts for DPG were rated as negligible.

5.12.5 Safety, Health, and Security Impacts at UTMB

A representative list of etiologic agents used at UTMB is provided in Section 2.4.6. UTMB had no recorded chemical injuries or LAIs during the performance of CBDP-related activities from 1997 through 2001 (see Sections 2.4.6.3 and 2.4.6.3.b). On that basis, the safety and health impacts for UTMB were rated as negligible.

5.12.6 Safety, Health, and Security Impacts at BMI, West Jefferson

A representative list of etiologic agents used at BMI is provided in Section 2.4.7.1. BMI had no recorded chemical injuries or LAIs during the performance of CBDP-related activities from 1997 through 2001 (see Sections 2.4.7.3 and 2.4.7.3.b). On that basis, the safety and health impacts for BMI were rated as minor.

5.12.7 Safety, Health, and Security Impact Summarization

Based on the limited number of LAIs recorded during 5 years of CBDP activities, from 1997 through 2001, the safety, health, and security impacts for the example sites have been negligible to minor. Such impacts are mitigated by adherence to benchmark guidelines and regulations for safety, health, and security mitigations, discussed in Section 2.3.5.

Management of the Army's biological defense (BD) RDT&E safety program was evaluated during 2000, pursuant to requirements of AR 385-69. The evaluation addressed safety management of the program at Headquarters, DA (HQDA), and at the Major Army Commands (MACOM) and installations where Army BD activities are conducted, including the U.S. Army Medical Research and Materiel Command, USAMRIID, the Walter Reed Army Institute of

Research, the Armed Forces Institute of Pathology, the U.S. Army Materiel Command, ECBC, the U.S. Army Test and Evaluation Command, and DPG. The scope of the evaluation included the following program areas: mishap and accident experience; reported etiologic agent spills; program waivers and exemptions; safety policy and program documentation; occupational health program documentation; chemical hygiene plans; facility maintenance control programs; spill control programs; emergency plans and coordination with institutional and governmental emergency services; contracting activities; medical surveillance program records; SOPs for serum sampling; immunization guidelines; specialized training for medical officers; Command approval of access to etiologic agent restricted areas; hazard analyses; SOPs and personnel training for BD RDT&E operations; safety inspections; and documentation for transfers of etiologic agents and associated waste. Updating of safety policy and procedures was identified as the one program area in greatest need of attention at all levels. Recommendations included strengthening coordination between the safety, industrial and chemical hygiene, and occupational health elements and increased oversight of BD RDT&E safety programs and activities by HQDA and MACOM. Safety program areas in need of strengthening were identified for each activity. Overall, management of the safety program was found to be adequate in providing for the safe conduct of BD RDT&E activities and in compliance with requirements of AR 385-69 (Office of the Director of Army Safety 2001).

5.13 Programmatic Evaluation

Table 5-1 is a matrix summarizing the results of the environmental impact analyses for each attribute area at each of the example sites. Each row comprises an attribute, and each column comprises a site. An additional column at the right summarizes programmatic impact assessments for each attribute, encompassing the impacts at all of the example sites. Note that the columns for ECBC and USAMRICD are merged for 10 of the impact areas, following the merged discussion of the existing environment at these facilities in Section 4.2, Safety, Health, and Security Impacts, but appear separately in the table, following the separate discussions in Sections 2.4.1.3 and 2.4.2.3 on mitigation of impacts.

5.13.1 Air Quality Impacts

The local air quality impacts of CBDP activities at the example sites range from negligible at UTMB to minor at several of the military installations (see Section 5.2.7). This is projected to a minor overall programmatic impact on air quality.

5.13.2 Biological Resource Impacts

The local biological resource impacts of CBDP activities at the example sites are all rated as negligible (see Section 5.3.7). This is projected to a negligible overall programmatic impact on biological resources.

5.13.3 Cultural Resource Impacts

The local cultural resources impacts of CBDP activities at the example sites are all rated as negligible (see Section 5.4.7). This is projected to a negligible overall programmatic impact on cultural resources.

5.13.4 Earth Resource Impacts

The local Earth resource impacts of CBDP activities at the example sites are all rated as negligible (see Section 5.5.7). This is projected to a negligible overall programmatic impact on Earth resources.

5.13.5 Land Use Impacts

The local land use impacts of CBDP activities at the example sites are all rated as negligible (see Section 5.6.7). This is projected to a negligible overall programmatic impact on land use.

5.13.6 Noise Impacts

The local noise impacts of CBDP activities at the example sites are all rated as negligible (see Section 5.7.7). This is projected to a negligible overall programmatic noise impact.

5.13.7 Socioeconomic and Environmental Justice Impacts

The local socioeconomic and environmental impacts of CBDP activities at the example sites are all beneficial, on balance, and range from negligible to minor (see Section 5.8.7). This is projected to a beneficial but negligible overall programmatic impact on socioeconomics and environmental justice.

5.13.8 Transportation and Airspace Impacts

The local transportation impacts of CBDP activities at the example sites range from negligible to minor (see Section 5.9.7). This is projected to a negligible overall programmatic impact on transportation, since local transportation impacts are inherently site specific.

5.13.9 Utilities Impacts

The local utilities impacts of CBDP activities at the example sites range from negligible to minor (see Section 5.10.7). This is projected to a negligible overall programmatic impact on utilities, since local utilities impacts are inherently site specific.

5.13.10 Water Resource Impacts

The local water resource impacts of CBDP activities at the example sites range from negligible to minor (see Section 5.11.7). This is projected to a minor overall programmatic impact on water resources.

5.13.11 Safety, Health, and Security Impacts

The local safety, health, and security impacts of CBDP activities at the example sites range from negligible to minor (see Section 5.12.7). This is projected to a minor overall programmatic impact on safety, health, and security.

Table 5-1. Summary of Environmental Impacts at the Example Sites by Attribute Area

	ECBC	USAMRICD	NSWCDL	USAMRIID	DPG	UTMB	BMI	OVERALL
Air Quality Impacts	M		M	M	M	n	M	M
Biological Resource Impacts	n		n	n	n	n	n	n
Cultural Impacts	n		n	n	n	n	n	n
Earth Resource Impacts	n		n	n	n	n	n	n
Land Use Impacts	n		n	n	n	n	n	n
Noise Impacts	n		n	n	n	n	n	n
Socioeconomic and Environmental Justice Impacts	M+		n+	M+	M+	n+	M+	n+
Transportation and Airspace Impacts	M		n	M	n	n	n	n
Utilities Impacts	M		n	M	M	n	M	n
Water Resource Impacts	n		n	M	M	n	M	M
Safety, Health, and Security Impacts	M	n	n	M	n	n	n	M

M = minor impact
n = negligible impact
+ = beneficial impact

5.14 Cumulative Impacts

Council on Environmental Quality regulations implementing the National Environmental Policy Act (NEPA) define cumulative impacts on the environment as those effects resulting from the impacts of the CBDP activities when combined with past, present, and future actions (40 CFR 1508.7). Thus, cumulative impacts are the sum of all direct and indirect impacts, both adverse and positive, that result from the incremental impacts of the action when added to other past, present, and reasonably predictable future actions, regardless of source. Cumulative impacts may be accrued over time and/or impacts in conjunction with other preexisting effects from other activities in the area (40 CFR 1508.25). Cumulative effects from actions that individually have minor impacts can result in a collectively significant impact.

The environmental impacts considered in analyzing cumulative impacts must focus on those that are truly meaningful (CEQ, January 1997, *Considering Cumulative Effects Under the NEPA*). Potential cumulative effects related to air quality include long-range transport of air pollutants, degradation of regional air quality, and releases of greenhouse gases. Potential cumulative effects related to biological resources include degradation, fragmentation, or loss of natural habitats; disruption of migrating fish or wildlife populations; loss of biological diversity; or mobilization of bioaccumulated substances through food chains. Potential cumulative effects related to Earth resources include soil erosion or degradation, or mobilization of persistent substances in soil. Potential cumulative effects related to water resources comprise discharges of sediment, heated water, or toxic pollutants to rivers or estuaries; reduction or contamination of groundwater supplies; or changes in the hydrologic regimes of rivers or estuaries. Potential cumulative effects related to the safety, health, and security attribute comprise standardization and maintenance or improvement of program components.

5.14.1 Cumulative Impacts over Time

The environmental analyses presented in Sections 5.2 through 5.12 were applied to current CBDP components at the selected example sites. Implicit in these analyses, through consideration of the existing environment, are the impacts of past actions at these sites under the CBDP, which dates back to about 1970, as well as similar actions under earlier programs involving offensive CB weapons. For example, impacts of existing soil and groundwater contamination on land use are addressed, as noted in Section 5.6.1.

The programmatic evaluation presented in Section 5.13 projected minor adverse programmatic impacts, locally, for CBDP activities upon the air quality; water resources; and safety, health, and security attributes. The potential programmatic time-cumulative effects, as enumerated above, are either negligible or minor and mitigable. The air quality and water resource impacts and mitigations are noted in Sections 5.2 and 5.11, respectively. The safety, health, and security impacts are presented in Sections 5.12.1 through 5.12.6. Section 5.12.7 presents an example of a programmatic mechanism for mitigation of time-cumulative impacts on standardization and maintenance or improvement of program components.

5.14.2 Cumulative Impacts in Conjunction with Other Programs

The environmental analyses presented in Sections 5.2 through 5.12 apply to current CBDP components at the selected example sites, as if isolated from other programs. Compliance with NEPA documentation requirements mitigates any potential cumulative impacts of planning and operation of CBDP components in conjunction with other programs.

This is illustrated by enumeration of existing NEPA documentation for the military installations among the example sites. NEPA documentation for ECBC and USAMRICD CBDP activities at APG, including the *USAMRICD Environmental Assessment (EA)* (USAMRICD 1992) and *Biolaboratory EA* (ECBC 1999), tier from the *APG Installation EA* (Advanced Sciences, Inc. 1990) and account for cumulative effects of other programs. Subsequent NEPA documentation for other programs at APG, such as the *Final PEIS, Transportable Treatment Systems for Non-Stockpile Chemical Warfare Materiel* (Program Manager, Non-Stockpile Chemical Warfare Materiel 2001), include the CBDP activities in their analyses of cumulative impacts. For

NSWCDL, the *Laboratory Operational Upgrade EA* (NSWCDL 2002) accounts for cumulative effects of chemical defense (CD) work in the same building as well as other programs at the installation. NEPA documentation for USAMRIID CBDP activities, including the *USAMRIID EA* (USAMRIID 2001a), used the *Fort Detrick Environmental Planning Guide* (Fort Detrick USAG 1998) in accounting for cumulative effects of other programs at the installation. For DPG, the *Draft EIS for Activities Associated with Future Programs at U.S. Army Dugway Proving Ground* (DPG 2001) accounts for cumulative effects of other programs at the installation.

NEPA documentation for private contractor-owned facilities is more limited. However, for BMI, the *EA of Joint Vaccine Acquisition Program-Sponsored Activities at the BMI West Jefferson Complex* (DoD 1999) provides an illustrative example of NEPA documentation accounting for cumulative effects of other programs.

5.14.3 Regionally Cumulative Impacts

Four of the example sites, ECBC, USAMRICD, NSWCDL, and USAMRIID, are located within an approximately 80.5-kilometer (50-mile) radius of Washington, D.C. These sites comprise an illustrative region for evaluation of potential programmatic cumulative regional environmental impacts.

The regionally cumulative air quality impacts may be potentially significant, since the local air quality impacts of the individual sites have been rated as minor (see Table 5-1). On a regional basis, the impacts of air emissions from these sites are diluted considerably by the numerous fixed major sources and population of vehicles in the Washington, D.C./Baltimore metropolitan area and by long-distance transport of air pollutants into the region from distant sources. Of the potential cumulative effects relative to air quality noted in Section 5.14, only deterioration of regional air quality specifically for the multicounty O_3 nonattainment area appears among potential air quality impacts for ECBC, USAMRICD, and USARMIID (see Sections 5.2.1 and 5.2.3). The impacts of O_3 and O_3 precursor emissions are mitigated by adherence to U.S. Environmental Protection Agency regional and state implementation plans under the Clean Air Act, as well as the benchmarks and local mitigation measures. Accordingly, the cumulative regional air quality impacts of these sites are rated as negligible.

Similarly, the regionally cumulative water resource impacts may be potentially significant, since the local water resource impacts of ECBC, USAMRICD, and NSWCDL all are negligible, and those for USAMRIID are rated minor (see Table 5-1). On a regional basis, the impacts of wastewater discharges from these sites are diluted considerably by numerous other point sources of water pollution and widespread area storm-water runoff. Of the potential cumulative effects relative to water resources noted in Section 5.14, only discharges of sediment, heated water, or toxic pollutants to rivers or estuaries appears among potential water quality impacts for ECBC, USAMRICD, NSWCDL, and USARMIID (see Sections 5.2.1 and 5.2.3). The Chesapeake Bay is the ultimate receptor for the regional discharges to surface waters. Cumulative regional impacts of sediment, thermal, and toxic pollutant discharges are mitigated by adherence to NPDES permit limits under the Clean Water Act. Accordingly, the cumulative regional water resource impact of these sites is rated as negligible.

In this illustrative example, it is very unlikely that other programmatic cumulative regional environmental impacts from CBDP activities would be significant, since the local impacts from all of the sites are minor.

5.15 Comparison of Alternatives

The proposed action consists of the execution of an integrated CBDP designed to protect our soldiers, sailors, marines, and airmen from the evolving CB threats they may encounter on the battlefield. This PEIS will be beneficial for the CBDP as a single reference source for up-to-date NEPA documentation, providing information on and analyses of both the BD and the CD programs. It will provide a basis for tiering of future environmental analyses under the CBDP, which will facilitate future government decision making as the program grows to meet evolving threats. It will have further benefits as an information source for other governmental agencies at all levels and for the public, sharing information on CBDP features that demonstrate DoD's commitment to protect the environment and to ensure public safety during the execution of this operationally mandated program.

The potential environmental impacts of future CBDP activities similar to those analyzed in this PEIS will be negligible to minor and mitigable by adherence to the benchmark guidelines and regulations listed in Section 2.3 and to appropriate SOPs similar to those presented in Section 2.4.

The only reasonable alternative to the proposed action is the No Action Alternative, that is, continuation of the current CBDP operations as described in and covered by existing environmental analyses, without benefit of the integrated program designed to protect against evolving threats. Less tiering of future planning decisions within the CBDP could reasonably be expected, in comparison to the Preferred Alternative. However, it is not reasonable to anticipate the occurrence of significant adverse environmental impacts as a result of the No Action Alternative. Recent planning within the CBDP has not resulted in a significant adverse environmental impact at any of the example sites, as discussed in Sections 5.2 through 5.13.

The future programmatic environmental impacts of the CBDP are projected to be essentially the same, whichever alternative is adopted. However, the proposed action is preferred to achieve the benefits cited above for the integrated program.